Homework lecture 1
Introduction to Distributed Algorithms

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Question 1: Will the following program (eventually) terminate? Assume that reading or writing a single variable is atomic.

$i \leftarrow 0$
$j \leftarrow 0$

thread while $i = 0$
  DO $j \leftarrow j + 1 \bmod 2$; print i
  print i

thread while $i = 0$
  do if $j = 0$ **then** $i = 1$

Question 2: Will the following program (eventually) terminate, or is it possible that it runs forever? Assume that reading or writing a single variable is atomic.

$a \leftarrow 1$
$b \leftarrow 1$

thread while $a \neq 0$
  do $b \leftarrow (b + a) \bmod 2$

thread while $b \neq 0$
  do $a \leftarrow a + 1$
  $a \leftarrow 0$

Question 3: Lamport's logical clock algorithm works in the message passing model. Modify Lamport's logical clock algorithm to assign logical clock values to all events in a shared memory system that supports atomic reads and atomic writes to shared memory. Prove that the logical clock created by your algorithm can be used to put the events in a total order $\langle A, \Rightarrow \rangle$ consistent with the partial order $\langle A, \rightarrow \rangle$.